

Rain Barrels and Cisterns

$$V_r = 0.5 \times N \times V_a$$

N - Number of rain barrels and/or cisterns

V_a (ft³) - Volume of each rain barrel and/or cistern

Form 2-2 includes storm water runoff reduction calculations that are equivalent to those in the SWRCB's SMARTS Runoff Reduction Calculator. The volume reductions calculated by these methods are dependent on the Site Design Measure(s) being designed per the requirements in the respective Fact Sheets in Appendix B.

In order to calculate runoff reductions, Form 2-2 requires the project elevation, which is inserted at the top of the form. The form then calculates the impervious runoff volume generated by the design storm. A table is included as a footnote to the form showing the design storm depths that correspond to the elevation of the project. Corresponding runoff volumes are calculated using a runoff coefficient of 0.9 for impervious surfaces.

Section 3 Requirements for Regulated Projects

This section addresses the requirements for Regulated Projects. The forms in this section are used to document project characteristics and to facilitate the selection and design of storm water control measures. Projects in this category are required to implement the following storm water control measures to the maximum extent practicable:

- LID site assessment to appropriately plan the layout of improvements for capturing and retaining storm water runoff;
- Source control measures to mitigate potential pollutant generating activities and sources that are anticipated at the site;
- Site Design Measures to infiltrate, evapotranspire, and/or harvest and use the impervious runoff from the post-construction 85th percentile, 24-hour storm runoff event; and
- Storm Water Treatment and Baseline Hydromodification Measures to infiltrate, evapotranspire, and/or bioretain remaining runoff from impervious surfaces, if necessary, after implementation of Site Design Measures.

Section 3 contains seven forms to address each of the above requirements.

Form 3-1 Site Location and Hydrologic Features

Enter the project specific information to document the site location and elevation to calculate the 85th percentile, 24-hour design storm depth. For reference, the table below provides the 85th percentile, 24-hour design storm depths for three elevation increments within the West Placer region.

85 th Percentile, 24-Hour Design Storm Depth
Elevation <500 feet = 0.9 inch
Elevation 500-1,000 feet = 1.0 inch
Elevation 1,000-1,500 feet = 1.1 inch

Identify the ultimate receiving waters and provide a general description of their location and distance in relation to the project site.

If the receiving waters are listed as impaired on the state 303(d) list, identify the pollutant(s) of concern. Refer to SWRCB website for the most current information:

www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/#impaired

For phased projects, the form clarifies requirements for defining DMAs and incorporating storm water control measures as each phase is developed.

This form is also used to define the project's DMAs, as described in Chapter 4. For projects with more than one DMA, a conceptual level schematic should be developed showing the DMAs that have been defined for the project and their hydrologic connections to the site discharge location(s). The conceptual DMA diagram in this form should be referenced when laying out DMAs and conveyances in the project's site plan as required in Form 3-2.

Form 3-2 LID Site Assessment and Layout Documentation

A site assessment must be conducted as early as possible in the project planning process to appropriately plan the site layout for the capture and treatment of storm water runoff. The goal is to develop a site layout that minimizes impacts to site hydrology and other environmental systems, functions, and processes.

The form lists a series of considerations that should be evaluated when developing the site layout. For each item, check the appropriate box to indicate that it has been considered and appropriately incorporated, or that it is not applicable (N/A) and provide a brief explanation (use a separate sheet if necessary). To complete this form, develop and attach a site plan that illustrates the proposed site layout. The site plan may consist of a preliminary or conceptual level design drawing, but it is a key requirement of the Preliminary SWQP described in Section 2.

Ensure that the following items are included in the site plan:

- Site boundary
- Soil types and areal extents, test pit and infiltration test locations
- Topographic data with 1-foot contours (5-foot contour intervals may be used for steeper sites)
- Existing natural hydrologic features (e.g., depressions, watercourses, wetlands, riparian corridors)
- Environmentally-sensitive areas and areas to be preserved
- Proposed locations and footprints of improvements creating new, or replaced, impervious surfaces
- Potential pollutant sources areas
- DMAs for the proposed BMPs that will receive storm water runoff
- Existing and proposed site drainage network with flow directions and site run-on and discharge locations
- Proposed design features and surface treatments used to minimize imperviousness and reduce runoff
- Proposed locations and footprints of treatment and hydromodification management facilities
- Design features for managing authorized non-storm water discharges
- Areas of soil and/or groundwater contamination
- Existing utilities and easements
- Maintenance areas

Form 3-3 Source Control Measures

Source control measures are required on all Regulated Projects to prevent onsite pollutants from being mobilized and transported by storm water runoff. The goal of source control is to keep clean water clean. For each item listed in the form, check the box for activities and sources that may occur on the project and use the Source Control Measures Selection Table (Appendix C) to identify permanent structural, and/or operational source control measures. Add project specific descriptions of how each measure will be implemented on the project and attach additional pages if necessary. Be sure to describe any special features, materials, or methods of construction that will be used to implement the source control measures. The identification codes in the table correspond to the CASQA fact sheets which can be referenced for more information on

each source control measure. The CASQA Storm Water BMP Handbooks are available for purchase at:

www.casqa.org/resources/bmp-handbooks/

Form 3-4 Runoff Reduction Calculator for Site Design Measures on Regulated Projects

On Regulated Projects, Site Design Measures must be implemented, to the extent technically feasible, to infiltrate, evapotranspire, and/or harvest and use the impervious surface runoff from the post-construction 85th percentile, 24-hour storm event.

For each DMA, identify the Site Design Measure(s) for implementation and enter the associated dimensions and quantity information into the form to calculate the resulting runoff reduction and the effective treated impervious area. Design guidance for Site Design Measures is provided in the Fact Sheets in Appendix B. The equations, variables and units that are used to calculate the Site Design Measure volume reductions (V_r) are presented below for reference.

Adjacent/On-Site Stream Setbacks and Buffers

$$V_r = \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \times A_{imp} \times V_{85}$$

A_{imp} (ft²) - Impervious drainage area discharging to the buffer

V_{85} (in) - Runoff volume from the 85th percentile, 24-hour design storm

Soil Quality Improvement and Maintenance

$$V_r = (A_{pond} \times D_{pond}) + (A_{sa} \times D_{sa} \times \eta)$$

A_{pond} (ft²) - Ponding area over soil improvement area

D_{pond} (ft) - Ponding depth over soil improvement area

A_{sa} (ft²) - Surface area of improved soils

D_{sa} (ft) - Depth, or thickness, of improved soil layer

η - Porosity of amended soil

Tree Planting and Preservation

$$V_r = [(218 \times n_e) + (109 \times n_d) + A_{tc}] \times V_{85} \times \left(\frac{1 \text{ ft}}{12 \text{ in}} \right)$$

n_e - Number of new evergreen trees

n_d - Number of new deciduous trees

A_{tc} (ft²) - Canopy area of existing trees to remain on the property

V_{85} (in) - Runoff volume from the 85th percentile, 24-hour design storm

Rooftop and Impervious Area Disconnection

$$V_r = \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \times A_{imp} \times V_{85}$$

A_{imp} (ft²) - Impervious rooftop or other area draining to pervious
infiltration area

V_{85} (in) - Runoff volume from the 85th percentile, 24-hour design storm

Porous Pavement

$$V_r = A_{res} \times D_{res} \times \eta_{agg} \times C$$

A_{res} (ft²) - Area of underlying gravel storage layer

D_{res} (ft) - Depth of underlying gravel storage layer

η_{agg} - Porosity of aggregate

C - Efficiency factor (0.5 recommended)

Vegetated Swales

$$V_r = \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \times A_{imp} \times V_{85}$$

A_{imp} (ft²) - Impervious rooftop or other area draining to swale

V_{85} (in) - Runoff volume from the 85th percentile, 24-hour design storm

Rain Barrels and Cisterns

$$V_r = 0.5 \times N \times V_a$$

N - Number of rain barrels and/or cisterns

V_a (ft³) - Volume of each rain barrel and/or cistern

Form 3-4 includes runoff reduction calculations that are equivalent to those in the SWRCB's SMARTS Runoff Reduction Calculator. The volume reductions calculated by these methods are dependent on the Site Design Measure(s) being designed per the requirements in the respective Fact Sheets in Appendix B.

Form 3-4 calculates the impervious runoff volume generated by the design storm using a runoff coefficient of 0.9 for impervious surfaces.

The form calculates the effective treated impervious area by dividing the runoff reduction by the 85th percentile, 24-hour design storm depth.

If the post-construction 85th percentile, 24-hour storm event runoff from all impervious surfaces in a DMA is treated, no additional storm water control measures are required for that DMA. If there is untreated impervious area remaining, then Storm Water Treatment and Baseline Hydromodification Measures are required.

Form 3-5 Computation of Water Quality Design Criteria for Storm Water Treatment and Baseline Hydromodification Measures

After implementation of Site Design Measures, any remaining storm water runoff for each DMA must be directed to one or more facilities designed to infiltrate, evapotranspire, and/or bioretain these remaining storm water flows. This form calculates the target Water Quality Volumes and Flows (WQV and WQF, respectively) using the tributary drainage area sizes and characteristics and local rainfall statistics. The Unit WQV referenced in the form is based on the site elevation and a 48 hr. drawdown time as follows:

Project Elevation (ft. above mean sea level)	Unit Water Quality Volume (WQV) (inches)
Over 1,000 ft.	0.9
500 ft – 1,000 ft.	0.75
Under 500 ft	0.65

Storm water runoff entering a site from adjacent properties (run-on) becomes the responsibility of the owner. When entering the DMA sizes in this form, all offsite areas that may contribute run-on flows to the treatment facility must be included.

For DMAs containing multiple types of land cover, the form requires the user to enter a composite, area-weighted, runoff coefficient representing the DMA. The composite runoff coefficient can be calculated as:

$$C_w = \frac{\sum_{j=1}^n C_j A_j}{\sum_{j=1}^n A_j}$$

- C_w = weighted runoff coefficient
- C_j = runoff coefficient for area j
- A_j (ft²) = area for land cover j
- n = number of distinct land covers

The equations, variables, and units that are used to calculate the WQV and WQF are presented below for reference.

Water Quality Volume (WQV)

$$WQV (ft^3) = \left(\frac{1 ft}{12 in} \right) \times A \times R_c \times WQV_u$$

A (ft²) – Tributary Area to BMP

R_c – Runoff coefficient

WQV_u (in) - Unit Water Quality Volume

Water Quality Flow (WQF)

$$WQF (ft^3/s) = \left(\frac{1 ft}{12 in} \right) \times \left(\frac{1 hr}{3600 s} \right) \times A \times i_u \times R_c$$

$$WQF (ft^3/s) = A_{untreated} * I_u * (1ft/12in) * (1hr/3600s)$$

A (ft²) – Tributary Area to BMP

i_u (in/hr) – Uniform Rainfall Intensity = 0.2 in/hr

R_c – Runoff coefficient

Form 3-6 Infiltrating Bioretention Measures

Form 3-6 is a sizing tool for volume-based, infiltrating bioretention facilities. Enter the dimensions and other required design parameters for each bioretention facility to calculate volume reductions and determine if the required performance criteria have been achieved. The form is intended to be used in conjunction with the bioretention BMP Fact Sheet(s) in Appendix B which provide additional design guidance.

The following inputs must be determined by the designer and entered into the appropriate cells:

- DMA ID No. – Previously defined DMAs for the Site Design Measures should be combined if they are draining to a single bioretention measure. Enter a unique identifier for the combined DMAs.
- Water Quality Volume (WQV) – If multiple DMAs are combined, as described above, the WQVs for each DMA must be summed.
- Surface Loading Rate (R_{surf})(in/hr)
- BMP Surface Area (top of BMP)(SA_{top}) (ft²)
- Infiltration rate of soils underlying the BMP (use field measurement at the level where infiltration will occur)(in/hr).
- Maximum ponding depth (d_{max}) (ft)

- Infiltrating surface area (bottom of BMP) (SA_{bottom}) (ft^2)
- Planting media depth (d_{media}) (ft)
- Planting media porosity (n_{media})
- Gravel depth (d_{gravel}) (ft)
- Gravel porosity (η_{gravel})
- Total Treated Flow Rate for Project (Q_{total}) (ft^3/s) – Enter the total sum of all treated flows from all DMAs

Calculated values in Form 3-6 include the following:

Ponding depth (d_{pond}) (ft) – This is determined by comparing the depth of water infiltrated within the drawdown time and the maximum ponding depth. The lesser value is taken as the ponding depth.

Retention Volume (V_d) (ft^3) – This is the total runoff volume reduction achieved by the bioretention measure. Retention volume is calculated as follows:

$$V_r = SA_{\text{bottom}} \times \left[d_{\text{pond}} + d_{\text{media}} \times \eta_{\text{media}} + d_{\text{gravel}} \times \eta_{\text{gravel}} + \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \times T_f \times I \times 0.5 \right]$$

The time of filling (T_f) represents the amount of time typically required for the bioretention measure to fill after the initial onset of rain. A value of 3 hours is assumed and is incorporated into the calculation.

A safety factor of 0.5 is applied to the field measured infiltration rate (I) to account for the degradation of this rate as the facility ages.

Untreated Volume ($V_{\text{untreated}}$) (ft^3) – This is the difference between the WQV and retention volume. The retention volume must be greater than or equal to the WQV for each DMA so that “Yes” can be checked as the final item to complete the form.

Treated Flow Rate (Q_{treated}) (ft^3/s) – This is the volumetric treatment rate achieved by the bioretention facility. The treated flow rate is calculated as follows:

$$Q_{\text{treated}} = \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \times \left(\frac{1 \text{ hr}}{3600 \text{ s}} \right) \times R_{\text{surf}} \times SA$$

If an alternative to bioretention is proposed, the designer must submit separate documentation to demonstrate that the proposed facility meets all of the following measures of equivalent effectiveness criteria when compared to bioretention facilities:

- Equal or greater amount of storm water runoff infiltrated or evapotranspired
- Equal or lower pollutant concentrations in storm water runoff that is discharged after biotreatment
- Equal or greater protection against shock loadings and spills
- Equal or greater accessibility and ease of inspection and maintenance

Form 3-7 Flow-Through Planters, Tree Box and Media Filters

This form provides a tool for flow-based sizing of biotreatment and filtration facilities. Enter the dimensions and other required design parameters for each biotreatment facility to calculate volume reductions and determine if the required performance criteria have been achieved. The form is intended to be used in conjunction with the Fact Sheets found in Appendix B for flow-through facilities to help determine the required dimensions of the structure.

The following inputs must be determined by the designer and entered into the appropriate cells:

- DMA ID No. – Previously defined DMAs for the Site Design Measures should be combined if they are draining to a single treatment measure. Enter a unique identifier for the combined DMAs.
- Water Quality Flow (WQF) – If multiple DMAs are combined, as described above, the WQFs for each DMA must be summed.
- Surface loading rate (R_{surf}) (in/hr) – A maximum of 5 in/hr is allowed.
- Maximum ponding depth (d_{max}) (ft)
- Soil/media surface area (SA) (ft²)
- Soil/media depth (d_{media}) (ft)
- Soil/media porosity (η_{media})
- Gravel depth (d_{gravel}) (ft)
- Gravel porosity (η_{gravel})

- Total Treated Flow Rate for Project (Q_{total})(ft^3/s) – Enter the total sum of all treated flows from all DMAs

Calculated values in Form 3-7 include the following:

Detention Volume (V_d) – This is the volume of storm water runoff detained by the flow-through facility for filtration and discharge. Detention volume is calculated as follows:

$$V_d = SA \times \left[d_{pond} + d_{media} \times \eta_{media} + d_{gravel} \times \eta_{gravel} + \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \times R_{surf} \times T_f \right]$$

The time of filling (T_f) represents the amount of time typically required for the bioretention measure to fill after the initial onset of rain. A value of 3 hours is assumed and is incorporated into the calculation.

Treated Flow Rate ($Q_{treated}$) (ft^3/s) – This is the volumetric treatment rate achieved by the flow-through planter or filter. The treated flow rate is calculated as follows:

$$Q_{treated} = \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \times \left(\frac{1 \text{ hr}}{3600 \text{ s}} \right) \times R_{surf} \times SA$$

Untreated Flow Rate ($Q_{untreated}$) (ft^3/s) – This is the difference between the WQF and the treated flow rate. The treated flow rate must be greater than or equal to the WQF for each DMA so that “Yes” can be checked as the final item to complete the form.

Form 3-7 also provides a line item for entering the treated flow rate for proprietary devices that do not follow the design approach specified in this form. For proprietary devices, the treated flow rate is entered and the product specifications and design documentation must be included in the SWQP to justify and document the flow rates used.

If an alternative to flow-through planters or tree box or media filters is proposed, the designer must demonstrate that the proposed facility meets all of the following measures of equivalent effectiveness criteria when compared to flow-through planters or tree box or media filters:

- Equal or greater rate of storm water treatment
- Equal or lower pollutant concentrations in storm water runoff that is discharged after biotreatment
- Equal or greater protection against shock loadings and spills
- Equal or greater accessibility and ease of inspection and maintenance

Section 4 Requirements for Hydromodification Management Projects

This section covers the additional requirements for Hydromodification Management Projects. Projects in this category must meet the same requirements as other Regulated Projects and also confirm that post-construction peak runoff rates are less than or equal to the pre-construction peak runoff rate for a 2-yr, 24-hr storm event.

This section incorporates the hydrology methods in Section V of the Placer County SWMM. There are three forms in this section which are used to determine the pre-project peak flows and demonstrate compliance.

For projects in sensitive environmental locations, such as those discharging to impaired waters or wetlands, and/or larger sized projects (> 200 acres) with ponding, where flow routing through sub-basins is required, or other projects with complex hydrologic characteristics, the jurisdictional agency may require an alternative approach to using the template forms. In these cases additional hydrologic modeling analyses, such as a HEC-1 or HEC-HMS discrete storm analysis may be required to compare pre- and post-project discharge rates for compliance. In these cases, the Section 4 forms should be replaced with model results documentation showing that post-construction runoff is less than or equal to the pre-construction runoff rate for a 2-yr, 24-hr storm event.

Hydromodification DMAs

The hydromodification analysis is performed at the project outlet points and requires that outlet level DMAs be defined for the project outlet points. These outlet level DMAs may be different than the previously defined DMAs used for BMP design, and will typically consist of combinations of these previously defined DMAs.

Form 4-1 Peak Runoff Response Time

Complete the form utilizing the reference information in the Placer County SWMM to calculate peak runoff response time for each outlet level DMA. The following inputs must be determined by the designer and entered into the appropriate cells:

- Length of longest overland flow path (L_o) (ft) – A maximum value of 100 feet is recommended since storm water runoff will typically concentrate and form rivulets or small gullies within this distance rather than staying in a sheet flow type regime.
- Slope of overland flow path (S_o) (ft/ft)
- Manning's roughness coefficient for the overland flow surface (n_o)
- Hydrologic soil group (HSG)
- Current Land Cover Type(s)

- Pervious Area Condition
- Infiltration Rate (I)(in/hr) – The rates for the newly define outlet level DMA are required to be entered. These may vary from the infiltration rates for the previously developed DMAs used for BMP design.
- Length of collector flow path (L_c)(ft)
- Cross-sectional area of collector flow facility (ft^2)(A)
- Wetted perimeter of collector flow facility (ft) (P)
- Manning's roughness coefficient for collector flow facility (n_c)
- Slope of collector flow facility (S_c)(ft/ft)

Calculated values in Form 4-1 include the following:

Overland flow response time (T_o)(min) – This is the response time of the overland flow areas for each DMA.

$$T_o = \left(\frac{0.355(nL)^{0.6}}{S_o^{0.3}} \right)$$

Channel flow velocity (V) (ft/s) – This is used to calculate the response time of the flow conveyances for each DMA and is calculated using Manning's equation as follows:

$$V = \frac{1.49}{n_c} \times \left(\frac{A}{P} \right)^{2/3} \times S^{0.5}$$

Collector flow facility response time (T_c) (min) – This is the response time of the flow conveyances for each DMA.

$$T_c = \left(\frac{1 \text{ min}}{60 \text{ s}} \right) \times \frac{L_c}{V}$$

Total response time (T_t) (min) – This is combined overland and collector flow response time.

$$T_t = T_c + T_o$$

Form 4-2 Hydromodification Target for Peak Runoff

Form 4-2 computes the peak pre- and post-construction storm water runoff rates for each outlet level DMA. This form also provides a comparison of the pre-project peak flows to the post-project peak flows and requires flow control at the BMP discharges to be modified, if necessary, to meet the hydromodification management performance criteria.

The following inputs must be determined by the designer and entered into the appropriate cells:

- Drainage Area (A) (ft²) – This is the total area of each outlet level DMA including pervious and impervious surfaces.
- Impervious Area (A_i)(ft²) – This is the total impervious area of each outlet level DMA.
- Rainfall depth (P_r) (in) – This is the depth of the 2-yr, 24-hour storm event with a duration equal to the total response time calculated in Form 4-1.
- Total Pre-Project Peak Runoff (ft³/s) – This is the combined total of the pre-project peak runoff rates for each DMA.

Calculated values in Form 4-2 include the following:

Unit peak runoff (q) (ft³/s/acre)

$$q = 60 \times P_2 \times \frac{1}{T_t}$$

Infiltration factor (F_i) (ft³/s/acre)

$$F_i = \left(1 + \frac{1}{1.3 \times 0.005 \times \text{Site Elevation}} \right)$$

Peak Runoff (Q_p) (ft³/s)

$$Q_p = A \times q - F_i \times (A - A_i)$$

Form 4-3 Detention Volumes for Hydromodification Management

Form 4-3 is used to demonstrate whether the combined detention capacity of the project's Site Design Measures and Storm Water Treatment and Baseline Hydromodification Measures is sufficient to meet the hydromodification requirements. The NRCS TR-55 Manual is utilized and referenced for information to complete this form and is available at the following website:

<http://www.hydrocad.net/pdf/TR-55%20Manual.pdf>

The following inputs must be determined by the designer and entered into the appropriate cells:

- Land cover and hydrologic condition
- Curve number (CN)
- Precipitation depth (P₂) (in) – This is the depth of the 2-yr, 24-hr storm event.

- Equalization factor (V_s/V_r) – The ratio of storage capacity to runoff volume. This is determined by using the attenuation factor and the nomograph in Figure 6-1 of the NRCXS RR-55 Manual for Type 1A rainfall distribution.
- Site Design Measure volume (ft^3) – This is the combined volume of all Site Design Measures within each of the outlet level DMA.
- Bioretention volume (ft^3) – This is the combined volume of all bioretention facilities within each of the outlet level DMA.
- Flow-Through Detention Volume (ft^3) – This is the combined volume of all flow-through treatment facilities within each of the outlet level DMA.
- Supplemental volume (ft^3) – This is the volume of any additional detention facilities that have been incorporated into the outlet level DMA to meet the hydromodification management performance criteria.

Calculated values in Form 4-3 include the following:

Post-development soil storage capacity (S) (in)

$$S = \frac{1000}{CN} - 10$$

Post-development runoff volume (V_{runoff}) (ft^3)

$$V_{\text{runoff}} = \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \times A \times \frac{(P_2 - 0.2 \times S)^2}{P_2 + 0.8 \times S}$$

Attenuation factor ($q_{\text{out/in}}$) – The ratio of the target outflow rate (pre-development peak discharge) to the peak inflow rate (post-development peak discharge).

$$q_{\text{out/in}} = \frac{\text{Pre-development } Q_p}{\text{Post-development } Q_p}$$

Runoff detention capacity required to achieve hydromodification management performance criteria (D_{hydromod}) (ft^3)

$$D_{\text{hydromod}} = \frac{V_s}{V_r} \times V_{\text{runoff}}$$

Combined Detention Volume (ft^3) – This is the combined volume of all Site Design Measures, bioretention facilities, and any supplemental volume in each outlet level DMA.

The combined detention volume must be greater than or equal to the required runoff detention capacity to achieve hydromodification management performance criteria so that "Yes" can be checked as the final item to complete the form.

Section 5 Inspection and Maintenance of Post-Construction BMPs

An O&M Verification Program will be implemented for all structural storm water control measures. Project owners must provide a signed statement, prior to Improvement Plan or Grading Permit approval, accepting responsibility for O&M requirements until the responsibility is legally transferred to another entity. A signed statement must also be provided that grants access to all representatives of the jurisdictional agency for the sole purpose of performing O&M inspections of the installed treatment systems(s) and hydromodification control(s) if any.

Form 5-1 BMP Inspection and Maintenance

For Regulated Projects, the Final SWQP serves as a Maintenance Agreement and Permission to Access Agreement unless the jurisdictional agency has a separate mechanism in place such as the City of Roseville. The City of Roseville requires a separate agreement according to its ordinance. The Final SWQP is recorded with the property ownership documentation to ensure that the maintenance responsibilities and access agreement are transferred to the subsequent owner(s) upon sale of the property.

For all BMPs included in the SWQP, assess the site-specific conditions and reference the Fact Sheets in Appendix B to develop BMP inspection and maintenance requirements and complete Form 5-1. For proprietary BMPs, reference the standard inspection and maintenance documents for the product. SWQPs are required to include a detailed O&M Plan for all BMPs (attach O&M Plan) and a signed certification statement accepting responsibility for its implementation.

Section 6 Compliance Checklist

The purpose of this section is to provide a mechanism for ensuring that all of the storm water control measures identified in the SWQP are also included on the approved Improvement Plans and will be constructed with the project.

Form 6-1 Post-Construction Storm Water BMPs

List each BMP included in the SWQP and the corresponding plan sheet number on the Improvement Plans. Create a copy of Form 6-1 and include it on the cover of the Improvement Plans.

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Glossary

Baseline Hydromodification Management Measures – Storm water control measures designed to mitigate hydromodification on Regulated Projects that are not Hydromodification Management Projects.

Best Management Practices (BMPs) – Methods, measures, or practices designed and selected to reduce or eliminate the discharge of pollutants to surface waters from point and non-point source discharges including storm water. BMPs include structural, which are permanent, and non-structural controls and operation and maintenance procedures, which when implemented prevents, controls, removes, or reduces pollution from entering surface waters.

Bioretention – Post-construction storm water treatment BMP that treats storm water runoff vertically through an engineered soil filter media and vegetation and retains storm water runoff on-site through infiltration or evapotranspiration.

Bioswale – Shallow channels lined with grass and used to convey and store runoff.

Brownfields - Sites with soil contamination.

Buffer – A forested or otherwise vegetated area located between water bodies such as streams, wetlands, and lakes that provides a permanent barrier against runoff from development, agriculture, construction, and other land uses. Buffers are designed to filter pollutants in storm water runoff before the pollutants reach surface waters.

California Environmental Quality Act (CEQA) Approval – Formal approval of a proposed project under CEQA (California environmental legislation that establishes procedures for conducting an environmental analysis for all projects in California [California Public Resources Code, Section 21000, et. seq.]).

California State Water Resources Control Board (SWRCB) - The state-level entity that regulates storm water runoff and treatment in California.

California Stormwater Quality Association (CASQA) – Statewide association of municipalities, storm water quality managers, and other interested parties. Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com. Successor to the Storm Water Quality Task Force (SWQTF).

Check Dam – Structures constructed of a non-erosive material, such as suitably sized aggregate, wood, gabions, riprap, or concrete, used to slow water to allow sedimentation, filtration, evapotranspiration, and infiltration into the underlying native soil. Check dams can be employed in practices such as dry and enhanced grass swales.

Clean Water Act (CWA) – (33 U.S.C. 1251 et seq.) The Federal Water Pollution Control Act.

Common/Larger Plan of Development or Sale – A contiguous area, plan area, specific plan, subdivision or any other project site that has evaluated storm water management and may be phased in the future or where multiple, distinct construction activities may be taking place at different times under one plan.

Conveyance System – Any channel, swale, gutter, or pipe for collecting and directing storm water.

Curb Cuts – Curb openings that allow storm water runoff to enter landscaped areas, vegetated swales, planters, rain gardens, and other BMP features.

Design Engineer – Engineer responsible for preparing the SWQP for Regulated Projects, site design, and site plan.

Design Storm – A synthetic rainstorm based on historic rainfall data. For purposes of this Manual, the design storm is defined as the volume of runoff produced from the 85th percentile, 24-hour storm event. In the West Placer County Phase II MS4 Permit area, the 85th percentile, 24-hour storm event varies with elevation as follows:

Elevation	85 th Percentile 24-Hour Storm Depth (Inches)
< 500 ft.	0.9
500 – 1,000 ft.	1.0
1,000 – 1,500 ft.	1.1

Detached Single-family Home Project – The building of one single new house or the addition and/or replacement of impervious surface associated with one single existing house, which is not part of a larger plan of development.

Storm Water Detention – The practice of temporarily storing peak storm water flows in basins, ponds, vaults, within berms, or in depressed areas and controlling the discharge rates into the storm drain system or receiving water. The detention process allows sediment and associated pollutants to settle out of the runoff.

Development – Any construction, rehabilitation, redevelopment, or reconstruction of any public or private residential project (whether single-family, multi-unit or planned unit development); industrial, commercial, retail and other non-residential projects, including public agency projects; or mass grading for future construction. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or

original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.

Direct Discharge – A discharge that is routed directly to waters of the United States by means of a pipe, channel, or ditch (including a municipal separate storm sewer system), or through surface runoff.

Directly Connected Impervious Area (DCIA) or Surface – Any impervious surface which drains directly into the storm drain system without first allowing flow through a pervious area (e.g., lawn).

Discharger – Any responsible party or site owner or operator within the Permittees' jurisdiction whose site discharges storm water or non-storm water runoff.

Disconnected Pavement – An impervious area that drains through a pervious area prior to discharge to the storm drain system.

Drainage Management Area (DMA) – A discrete area within a project site that contributes all precipitation falling within its boundaries to a single common outflow point, and is defined for the purpose of siting and designing storm water control measures in accordance with the Phase II MS4 Permit.

Drawdown Time – The time required for a storm water detention or infiltration BMP to drain and return to the dry-weather condition. For detention BMPs, drawdown time is a function of basin volume and outlet orifice size. For infiltration BMPs, drawdown time is a function of basin volume and infiltration rate.

Environmentally Sensitive Area (ESA) – A designated area that requires special protection because of its landscape, wildlife, and/or historical value.

Erosion – The physical detachment of soil due to wind or water. Often the detached fine soil fraction becomes a pollutant transported storm water runoff. Erosion occurs naturally, but can be accelerated by land disturbance and grading activities such as farming, development, road building, and timber harvesting.

Evapotranspiration (ET) – The general uptake and release of water by vegetation to the atmosphere.

Existing Road Project – Proposed redevelopment street/road project that will modify or redevelop an existing transportation surface in a manner that increases the surface footprint or impervious area of the roadway.

Filter Strip – Bands of closely-growing vegetation, usually grass, planted between pollution sources and downstream receiving water bodies.

Filtration Rate – The rate at which fluid passes through a porous medium (or media).

Flow-Based Treatment Control Measures – Storm water quality treatment measures that rely on flow capacity to treat storm water. These measures remove pollutants from a moving stream of water through filtration, infiltration, adsorption, and/or biological processes (e.g., vegetated swales and filter strips).

Flow-Through Planters – Structural landscaped reservoirs placed on impervious surfaces used to collect, filter, and temporarily store storm water runoff, allowing pollutants to settle and filter out as the water percolates through the planter soil until flowing through to an approved conveyance.

Green Roof – Conventional rooftops that include a thin covering of vegetation allowing the roof to function more like a vegetated surface. The layer thickness varies between 2-6 inches and consists of vegetation, waterproofing, insulation, fabrics, growth media, and other synthetic components.

Green Street – A Green Street uses a natural systems approach to reduce storm water flow, improve water quality, reduce urban heating, enhance pedestrian safety, reduce carbon footprints, and beautify neighborhoods. Green Street features include vegetated curb extensions, sidewalk planters, landscaped medians, vegetated swales, permeable paving, and street trees. (EPA, 2009)

Groundwater – Water that is underground in cracks and spaces in soil, sand, and rocks. The layers of soil, sand, and rocks are also known as aquifers.

Groundwater Recharge – The replenishment of existing natural water bearing subsurface layers of porous stone, sand, gravel, silt or clay via infiltration.

Hydrograph – Runoff flow rate plotted as a function of time.

Hydrologic Cycle – The movement of rainfall from the atmosphere to the land surface, to receiving waters and then back to the atmosphere through evaporation.

Hydrologic Soil Group – A soil classification system created by the National Resource Conservation Service (formerly Soil Conservation Service) based on the ability to convey and store water; divided into four groups:

- A – well drained sands and gravel, high infiltration capacity, high leaching potential and low runoff potential;
- B – Moderately drained fine to coarse grained soils, moderate infiltration capacity, moderate leaching potential and moderate runoff potential;
- C – Fine grained, low infiltration capacity, low leaching potential and high runoff potential;

- D – Clay soils, very low infiltration capacity, very low leaching potential and very high runoff potential.

Typical Infiltration Rates

Soil Type (Hydrologic Soul Group)	Infiltration Rate (in/hr.)
A	1.00 – 8.3
B	0.5 – 1.00
C	0.17 – 0.27
D	0.02 – 0.10
Infiltration rates shown represent the range covered by multiple sources, e.g., ASCE, BASMAA, etc.	

Hydrology – The science dealing with the waters of the earth, their distribution on the surface and underground, and the cycle involving evaporation, precipitation, and flow to the seas.

Hydromodification – Modification of hydrologic pathways (precipitation, surface runoff, infiltration, groundwater flow, return flow, surface-water storage, groundwater storage, evaporation and transpiration) that results in negative impacts to watershed health and functions. Hydromodification results in an artificially altered rate of natural channel erosion and sedimentation processes.

Impaired Water Body – A waterbody (i.e., stream reaches, lakes, waterbody segments) with chronic or recurring monitored violations of the applicable numeric and/or narrative water quality criteria. An impaired water is a water that has been listed on the California 303(d) list or has not yet been listed but otherwise meets the criteria for listing. A water is a portion of a surface water of the state, including ocean, estuary, lake, river, creek, or wetland. The water currently may not be meeting state water quality standards or may be determined to be threatened and have the potential to not meet standards in the future. The State of California's 303(d) list can be found at <http://www.swrcb.ca.gov/quality.html>.

Impervious Surface – A surface covering or pavement of a developed parcel of land that prevents the land's natural ability to absorb and infiltrate rainfall/storm water.

Infiltration – The entry of water into the soil. Infiltration rate (or infiltration capacity) is the maximum rate at which a soil in a given condition will absorb water.

Jurisdictional Agency – The municipal agency/agencies with approval authority for private and public projects that fall under the requirements of the Phase II MS4 Permit.

Linear Underground/Overhead Projects (LUPs) – Include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio, or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/or pavement repair or replacement, and stockpile/borrow locations.

Low Impact Development (LID) – A sustainable practice that benefits water supply and contributes to water quality protection. Unlike traditional storm water management, which collects and conveys storm water runoff through storm drains, pipes, or other conveyances to a centralized storm water facility, LID takes a different approach by using site design and storm water management to maintain the site's pre-development runoff rates and volumes. The goal of LID is to approximate a site's pre-development hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain storm water runoff close to the source of rainfall.

Maximum Extent Practicable (MEP) – The minimum required performance standard for implementation of municipal storm water management programs to reduce pollutants in storm water. Clean Water Act § 402(p)(3)(B)(iii) requires that municipal permits "shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants." MEP is the cumulative effect of implementing, evaluating, and making corresponding changes to a variety of technically appropriate and economically feasible BMPs, ensuring that the most appropriate controls are implemented in the most effective manner. This process of implementing, evaluating, revising, or adding new BMPs is commonly referred to as the iterative process.

Municipal Separate Storm Sewer System (MS4) – The regulatory definition of an MS4 (40 CFR 122.26(b)(8)) is "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created to or pursuant to state law)

including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States. (ii) Designed or used for collecting or conveying storm water; (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

In practical terms, operators of MS4s can include municipalities and local sewer districts, state and federal departments of transportation, public universities, public hospitals, military bases, and correctional facilities. The Storm Water Phase II Rule added federal systems, such as military bases and correctional facilities by including them in the definition of small MS4s.

National Pollutant Discharge Elimination System (NPDES) – A national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Clean Water Act.

Natural Resources Conservation Service (NRCS) – NRCS provides technical expertise and conservation planning for farmers, ranchers and forest landowners wanting to make conservation improvements to their land.

Non-Storm water Discharge – Any discharge to a storm drain that is not composed entirely of storm water. Certain non-storm water discharges are authorized per the NPDES Municipal Stormwater Permits.

Open Space – Pervious area within the project that is subtracted from the total project area to reduce the area used in sizing treatment and LID BMPs. For LID implementation, open space includes, but is not limited to, natural storage reservoirs, drainage corridors, buffer zones for natural water bodies, and flood control detention basins.

Operations and Maintenance (O&M) – Continuing activities required to keep storm water management facilities and their components functioning in accordance with design objectives.

Outfall – A point source, as defined by 40 CFR 122.2, at the point where an MS4 discharges to waters of the United States and does not include open conveyances connecting two MS4s, or pipes, tunnels or other conveyances which connect segments of the same stream or other waters of the United States and are used to convey waters of the United States.

Peak Discharge Rate – The maximum instantaneous rate of flow (volume of water passing a given point over a specific duration, such as cubic feet per second) during a storm, usually in reference to a specific design storm event.

Permeable – Soil or other material that allows the infiltration or passage of water or other liquids.

Permeable or Pervious Pavement – Asphalt or concrete rendered porous by the aggregate structure surfaces that allow water to pass through voids in the paving material and/or between paving units while providing a stable, load-bearing surface. An important component to permeable pavement is the reservoir base course, which provides stability for load-bearing surfaces and underground storage for runoff.

Permittee/Permittees – Municipal agency/agencies and non-traditional small MS4s that are named in and subject to the requirements of the Phase II MS4 Permit.

Phase II MS4 Permit - SWRCB Water Quality Order No. 2013-001-DWQ, NPDES General Permit No. CAS000004, Waste Discharge Requirements for Storm Water Discharges from Small MS4s.

Placer County Aquatic Resources Program (CARP) – A multidisciplinary approach for identifying, classifying, ranking, and protecting the aquatic resources of western Placer County. Broadly defined, aquatic resources are those now regulated by the U.S. Army Corps of Engineers, CVRWQCB, the California Department of Fish and Game, and the City of Lincoln and Placer County General Plans.

Placer County Conservation Plan (PCCP) – A Placer County-proposed solution to coordinate and streamline the permitting process by allowing local entities to issue state and federal permits. The proposed PCCP is a Habitat Conservation Plan (HCP) under the Federal Endangered Species Act and a Natural Community Conservation Plan (NCCP) under the California Natural Community Conservation Planning Act.

Placer County Stormwater Management Manual (SWMM) – A guidance manual produced by the Placer County Flood Control District and Water Conservation District to provide consistent, specific guidance and requirements for storm water management, including regulation of the development process, to achieve storm water management objectives.

Pollutant – Those substances defined in CWA §502(6) (33.U.S.C. §1362(6)) and incorporated by reference into California Water Code §13373.

Porosity – Ratio of pore volume to total solids volume.

Project Owner – Owner of a parcel proposed for development or redevelopment.

Rain Event or Storm Event – Any rain event greater than 0.1 inch in 24 hours except where specifically stated otherwise.

Rain Garden – A lot-level bioretention cell designed to receive and detain, infiltrate, and filter storm water runoff, typically used for discharge from roof leaders.

Rainwater Harvesting – The practice of intercepting, conveying, and storing rainwater for future use. Captured rainwater is typically used for outdoor non-potable water uses such as irrigation and pressure washing, or in the building to flush toilets or urinals or other uses that do not require potable water.

Receiving Water – Surface water that receives regulated and unregulated discharges from activities on land.

Recharge – The infiltration and movement of surface water into the soil, past the vegetation root zone, to the zone of saturation or water table.

Reconstruction – The removal and replacement of paving material down to subgrade.

Redevelopment – Land-disturbing activity that results in the creation, addition, or replacement of exterior impervious surface area on a site on which some past development has occurred. Redevelopment does not include trenching, excavation and resurfacing associated with LUPs; pavement grinding and resurfacing of existing roadways; construction of new sidewalks, pedestrian ramps, or bike lanes on existing roadways; or routine replacement of damaged pavement such as pothole repair or replacement of short, non-contiguous sections of roadway.

Regional Water Quality Control Board (RWQCB) – California RWQCBs are responsible for implementing pollution control provisions of the Clean Water Act and California Water Code within their jurisdiction.

Regulated Project – Refers to projects subject to the new and redevelopment standards in Section E.12 in the Phase II MS4 Permit.

Regulated Small MS4 – A Small MS4 that discharges to a water of the United States or to another MS4 regulated by an NPDES permit and has been designated as regulated by the SWRCB or RWQCB under criteria provided in the Phase II MS4 Permit.

Retention – The practice of holding storm water in ponds or basins and allowing it to slowly infiltrate to groundwater. Some portion will evaporate. Also see infiltration.

Retrofitting – Improving pollution and/or flow control at existing developments and facilities to protect or restore beneficial uses and watershed functions.

Riparian Areas – Plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent waterbodies. Riparian areas have one or both of the following characteristics: 1) distinctively different vegetative species than adjacent areas, and 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian areas are usually transitional between wetland and upland.

Runoff – Water flowing across the land that does not infiltrate the soil, but drains into surface or groundwater, or when rainfall exceeds the infiltration capacity of the land.

Run-on – Storm water surface flow or other surface flow that enters property that did not originate onsite.

Setback – The minimum distance that design elements must be placed from other elements. For example, houses usually have front, side, and rear yard setbacks from streets and other buildings.

Site Design Measure – Typically small, distributed structural or non-structural measures that aim to reduce the volume of storm water runoff close to the source of the rainfall.

Soil Amendment – Minerals and organic material added to soil to increase its capacity for absorbing moisture and sustaining vegetation.

Source Control – Land use or site planning practices, or structural or non-structural measures, that aim to prevent pollution of runoff by reducing the potential for contact with runoff at the source of pollution. Source control measures minimize the contact between pollutants and urban runoff.

Storm Water – Storm water is generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground. As storm water flows over the land or impervious surfaces, it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the storm water is discharged untreated.

Storm Water Management – The process of collecting, conveying, storing, treating, and disposing of storm water to ensure control of the magnitude and frequency of runoff to minimize the hazards associated with flooding and the impact on water quality caused by manmade changes to the land.

Storm Water Quality Plan (SWQP) – The SWQP documents a project's compliance with the Phase II MS4 Permit and provides a standardized application form that produces complete and accurate submittals which result in more efficient reviews and project approvals.

Surface Loading Rate (R_{surf}) – A hydraulic loading factor, expressed in terms of flow over surface area, representing the flow rate of storm water runoff over the surface area of the treatment measure (i.e. a bioretention cell).

Swale – A shallow storm water channel that can be vegetated with some combination of grasses, shrubs, and/or trees designed to slow, filter, and often infiltrate storm water runoff.

Total Maximum Daily Loads (TMDLs) – The maximum amount of a pollutant that can be discharged into a water body from all sources (point and nonpoint) and still meet water quality standards. Under CWA section 303(d), TMDLs must be developed for all water bodies that do not meet water quality standards even after application of technology-based controls, more stringent effluent limitations required by a state or local authority, and other pollution control requirements such as BMPs.

Treatment – The application of engineered systems that use physical, chemical, or biological processes to remove pollutants. Such processes include, but are not limited to, filtration, gravity settling, media absorption, biodegradation, biological uptake, chemical oxidation, and ultraviolet light radiation.

Treatment Control Measure – Any engineered system designed to remove pollutants by simple gravity settling of particulate pollutants, filtration, biological uptake, media absorption, or any other physical, biological, or chemical process.

Tributary Area – The physical area that drains to a specific BMP or drainage feature.

Underdrain – A perforated pipe used to assist the draining of soils in some LID applications that have impaired infiltration.

Urban Runoff – Any runoff from urbanized areas that enters the MS4 including storm water and dry weather flows from a drainage area that reaches a receiving water body or subsurface. During dry weather, urban runoff may be comprised of groundwater base flow and/or nuisance flows, such as excess irrigation water.

Vegetated Filter Strip – Gently sloping, densely vegetated areas that treat runoff as sheet flow from adjacent impervious areas. They function by slowing runoff velocity and filtering out suspended sediment and associated pollutants, and by providing some infiltration into underlying soils. Also known as buffer strips and grassed filter strips.

Vegetated Swale – A long and narrow, trapezoidal or semicircular channel, planted with a variety of trees, shrubs, and grasses or with a dense mix of grasses. Storm water runoff from impervious surfaces is directed through the swale, where it is slowed and in some cases infiltrated, allowing pollutants to settle out. Check dams are often used to create small ponded areas to facilitate infiltration.

Volume-Based Treatment Control Measures – Storm water quality treatment measures that rely on volume capacity to treat storm water runoff. These measures detain or retain runoff and treat it primarily through settling or infiltration. Examples: detention and infiltration basins, porous pavement and storm water planters (bioretention).

Water Quality Flow (WQF) – For storm water treatment BMPs that depend on flow-through processes, such as filtration, to work, the flow rate of water that must be passed through the facility to achieve maximum extent practicable pollutant removal.

Water Quality Volume (WQV) – For storm water treatment BMPs that depend on detention to work, the volume of water that must be detained to achieve maximum extent practicable pollutant removal.

Water Table – Subsurface water level defined by the level below which all the spaces in the soil are filled with water; the entire region below the water table is called the saturated zone.

Web Soil Survey (WSS) – An interactive, internet-based soils database developed and administered by NRCS.

Wet Season (Rainy Season) – For the West Placer region, the calendar period beginning October 1 and ending April 30. Note: This differs from the California Department of Fish and Wildlife's wet weather definition, which is October 15 – April 15.